TABLE 4.—*Comparison of the meteorological conditions, etc.*,—Continued.

LOWEST TEMPERATURE.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
Yuma	22	25	31	38	44	52	61	60	50	41	31	24
Mammoth .:	27	38	40	32	40	52	60	52	52	53	28	25
Indio........	23	38	39	42	43	62	69	67	48	40	28	20
Carson City (Reno.)	−22	−14	10	16	22	27	35	34	18	17	7	− 7

MEAN PRECIPITATION.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Ins.	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*	*Ins.*
Yuma	0.40	0.50	0.30	0.10	T.	T.	0.10	0.30	0.10	0.20	0.30	0.40
Mammoth...	0.00	1.40	T.	1.40	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.30
Indio.......	0.30	1.20	1.45	0.20	0.00	0.00	0.00	0.50	0.00	0.00	0.75	1.00
Carson City (Reno.)	2.56	1.49	1.33	0.87	0.61	0.43	0.17	0.13	0.28	0.41	1.50	2.19

RELATIVE HUMIDITY AT CARSON CITY.

75th meridian time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	%	%	%	%	%	%	%	%	%	%	%	%
8 a. m......	80	81	77	71	70	60	56	61	63	71	75	74
8 p. m......	65	71	56	35	41	29	26	30	31	40	55	50

The expedition to Reno, Nev., is being furnished with some improved pieces of apparatus, constructed by the cooperation and devices of Prof. C. F. Marvin, U. S. Weather Bureau, and embodying some suggestions furnished by Mr. Lyman T. Briggs, U. S. Department of Agriculture, and Mr. Edgar Buckingham, Bureau of Standards. These include a measuring micrometer for differential changes in the level of a water surface, an electrical device for maintaining a fixt surface level and measuring the cubic contents of evaporated water, an improved Piche evaporimeter, an anemometer transformed for reading wind velocities in kilometers per hour instead of miles per hour. The evaporating pans and the auxiliary contrivances, such as towers for the equipotential surfaces, tubes for the Stefan formula, and so on, will be constructed at Reno.

Prof. F. H. Bigelow and Mr. H. L. Heiskell go to Reno from Washington, D. C, and will be assisted there by Mr. Harry O. Geren, Section Director, and such further assistants as may be found necessary in reading the thermometers and other pieces of apparatus.

TORNADO AT PARKERSBURG, W. VA.

[Compiled from reports furnished by H. C. Howe, Section Director.]

On the afternoon of Monday, July 22, 1907, a small tornado past over Belpre, Ohio, and Parkersburg, W. Va., two places situated directly across the Ohio River from each other. The windstorm struck Parkersburg at 5:26 p. m., seventy-fifth meridian time, and lasted about three minutes. It came very suddenly and was accompanied by a loud roaring noise. Observers along the river front or at vantage points state that a funnel-shaped cloud, dark gray in color, suddenly shot down from the black clouds overhanging the city, and that the small end of this cloud traveled very near the ground and rotated rapidly. Lightning accompanied the storm, but no vivid flashes were seen. The rainfall was light and no hail was observed.

The storm moved from the northwest to the southeast. Its track could be traced for about one and one-fourth miles, but the greatest width was only about three hundred feet. The southern limit of the storm past two blocks north of the local office of the Weather Bureau in Parkersburg. By the meteorograph record at the office the wind from 5:27 to 5:28 p. m. blew at the rate of 54 miles per hour, but for a 5-minute interval the mean velocity was only 39 miles per hour; the direction was northwest, tho previous to the storm it had been southwest. The pressure, as shown by the barograph, rose suddenly one-tenth of an inch, from 29.85 to 29.95 inches (sea-level).[1] The temperature at 4:30 p. m. was 92°; at about 5:25, 90°; but at 6:00 p. m. it had fallen to 67°. The recorded precipitation amounted to 0.24 inch.

In addition to the statements of observers that the cloud had a whirling motion much may be judged as to the character of the storm from a study of the débris. Nearly all the trees and tops of trees fell toward the north or northeast, and one roof that was removed was thrown toward the north. Windows were broken on the north sides of buildings. One tree standing near the east side of a house was broken down and another tree was apparently twisted off. In Belpre a small house, about forty feet long, sixteen feet wide, and a story and a half high, was blown from its foundation, which consisted of brick piers rising about three feet above the ground. The house was moved about fifty feet in a northeast direction, turned nearly one-quarter round, and completely wrecked. An outbuilding which had stood about forty feet northwest of the house was blown some distance in a nearly opposite direction (southwest).

No lives were lost, but two persons were slightly injured in the wrecking of the house at Belpre. Several smokestacks and roofs were blown off their buildings. Some trees were destroyed by being uprooted or broken off near the ground, and many other tree tops were damaged. Considerable damage was done to telephone wires, but the total pecuniary loss from the storm is estimated at only $5000.

AUSTRALIAN CLIMATOLOGY.

Pending the reorganization of the federal department of meteorology for all Australia the individual state governments still continue their meteorological publications, and we recently received from the meteorological department of the Sydney Observatory several sets of charts illustrating the general characteristics of the meteorology of this continent. Among these charts we note the following:

(1) The weather chart published daily in the Daily Telegraph at Sydney. A few special separate prints of these important charts are struck off for distribution, and they afford the only basis as yet available for meteorologists to study the movements of highs and lows in that region. The highs approach Australia from the southwest and move eastward or northeastward toward the equator. The lows approach from the northwest or west and move eastward or southeastward, that is, away from the equator. The descending air of the highs gives the interior of tropical Australia its characteristic clear, hot, dry, weather, analogous to that of the tropical deserts of Africa, Arabia, Syria, northern India, New Mexico, Arizona, Texas, Peru, Chili, and the California Peninsula. The Australian Continent does not extend far enough south to allow antarctic highs and blizzards to reach its southern latitudes, analogous to those that descend from latitude 60° north into the interior of the United States of America. If such exist they are probably dissipated by the influence of the southern oceans. This great ocean surface not only mollifies the low temperatures of the highs, but by its smoothness allows the formation and maintenance of the steady stream of strong west winds between latitudes 40° and 55° south. These winds are in fact the mechanical representatives of the westerly winds that precede our American highs. The alternations of wind and calm that attend our highs are feebly represented in the Antarctic region, where the wind is more steady and calms are unknown, because of the steady supply of descending air. In forecasting the weather, as is done daily from these Australian maps, one must bear in mind this tendency of highs and lows to be rapidly converted into a long

[1] The rise in station pressure was from 29.20 to 29.30, the station barometer at Parkersburg being 638 feet above sea level.

band of westerly winds, while the easterly winds disappear even more easily a little way south of the southern coasts of that continent.

In general dry air is denser than moist air of the same pressure and temperature. Lines of equal density drawn on the globe show that a unit volume of continental denser air is driven by centrifugal force toward the equator more forcibly than the same volume of oceanic moister air. The interaction of such masses is much more prominent in the Northern than in the Southern Hemisphere, where densities are more equable and every phenomenon is dominated by the great antarctic vortex. Here the air overflowing from the Tropics whirls around the South Pole as at *a* and *b*, fig. 1, descending more slowly than in our Arctic regions. But eventually its temperature falls by radiation more than it warms by descent, and it reaches a low level, where it is at once whirled outward, as at *c* and *d*, thus constituting a great anticyclone in the Southern Hemisphere analogous to the cyclone with cold center in the Northern Hemisphere, as originally explained by Ferrel. The reason why the upper air at *a* flows inward and the lower air at *d* flows outward is that the upper air has a potential density greater than the lower air, since the latter has lost some heat by radiation; hence for the same velocity of rotation around the South Pole the lower air has a larger centrifugal component, and as it flows outward the upper air must descend to take its place. A similar centrifugal force is utilized daily in our drying machines, cream separators, and other devices.

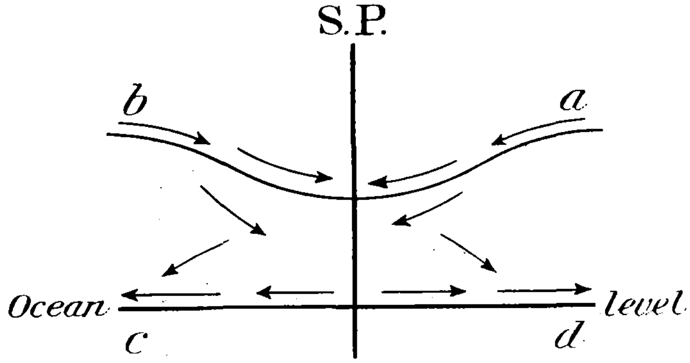

FIG. 1.—The general circulation about the South Pole.

As the air that has descended experiences greater resistance as it flows along over the Antarctic Continent toward *c* and *d* than it did when flowing as upper air from *a* and *b* toward the pole, therefore its velocity is diminished somewhat, and a slight increase in the gradient of pressure toward the equator is produced near the polar region; so that the pressure at sea level in that region is a little higher than in a zone of lowest pressure that must be formed somewhere near the Antarctic Circle.

(2) The four seasonal charts and one annual chart of isotherms and isobars with prevailing winds, and especially the seasonal and annual charts of rainfall with diagrams of monthly and annual temperatures and the rainfall at Sydney, N. S. W., 1840–1906, will tempt many to search for periods and correlations. But we must urge that any such effort be made with full recognition of the internal mechanics of the atmosphere, and not by any purely superficial methods. The latter are too apt to lead to error; the former are more difficult, but are rational and must eventually lead up to important generalizations.—*C. A.*

ELECTRIC SPARK PRODUCED WHEN ICE IS FORMED.

Dr. T. L. Phipson, in his book "Phosphorescence", London, 1862, page 29, publishes the following suggestive paragraph:

> A most interesting production of light was observed and published ("Journ. des Sc. Physiques et Chimiques", de M. de Fontenelle) by Professor Pontus, in 1833, who showed that a vivid spark is produced when water is made to freeze rapidly. A small glass globe, terminating in a short tube, is filled with water, the whole is covered with a sponge or cotton-wool imbibed with ether, and placed in an air-pump. As soon as the experimenter begins to produce a vacuum, the ether evaporates, and the sponge or cotton-wool dries, the temperature of the water descends rapidly. But some instants before congelation takes place, *a brilliant spark, perfectly visible in the daytime*, is suddenly shot out of the little tube that terminates the glass globe. M. Pontus has repeated the experiment often, and says that the production of this spark is a sure sign that congelation is about to happen.

The Editor has not been able to obtain the original memoir by Professor Pontus, but if there be no mistake in this experiment and observation then we have here a very plausible explanation of the origin of the lightning that attends hail and thunderstorms in the summer and equally so of the gentler electric discharges attending thunderstorms in winter—possibly also of the still gentler auroral discharge. Will not some one investigate this subject anew?—*C. A.*

THE JAMAICAN WEATHER SERVICE.

By D. T. MARING, Instrument Division, U. S. Weather Bureau. Dated August 1, 1907.

The reestablishment of the weather service for the island of Jamaica, under its own government control, will be welcomed by all interested in meteorology. Tho comparatively small in extent of territory, this island occupies an important geographical and meteorological position in the West Indies, at the northern edge of the Tropics. What might otherwise be a torrid and unbearable climate is completely modified by the lofty mountains of the interior. The healthfulness of the temperate zone is combined with the beauties of tropical scenery, to the delight and admiration of hundreds of tourists who annually land on its shores.

At the time when the general meteorological service of the United States was temporarily extended to embrace all of the West Indies, in 1898, a fully equipped station was established at Kingston, in August of that year. It was found that none of the comparatively low buildings in the business part of the city of Kingston afforded suitable exposures for the Weather Bureau instruments, and it was necessary to locate the station in the residential section of the suburbs. The building selected was a new residence villa belonging to Mr. Humphreys, C. E., situated on the road to the King's House, a short distance above the point known as "Half Way Tree", about 3 miles northwest of the cable office; here the barometers had an elevation of 286 feet above sea level. The exposures of instruments are clearly shown on the accompanying photograph, fig. 1, procured July, 1899, by Mr. C. F. Talman, observer in charge at that time. The observations and records of this station were, of course, placed at the command of all Jamaicans, and shortly afterwards (February, 1899), the local government service that had been maintained for many years, was discontinued. In July, 1903, it became necessary for the U. S. Weather Bureau to discontinue its fully equipped station at Kingston, since which time a special hurricane station only has been kept in operation from July to October of each year. The instrumental equipment of this hurricane station having been wrecked in the earthquake of January, 1907, as shown by photograph, fig. 2, the writer was detailed to proceed to Kingston and reestablish this telegraphic reporting station for the current year. Upon arrival at Kingston the conditions were found to be such as to preclude the possibility of reopening the station, as formerly, in the hands of local operators of the cable company. It was then ascertained that for several years past Jamaican scientists and members of their agricultural society had been agitating the question of restoring their own government weather service. This was felt to be urgently needed, not only for their own climatic studies, but for the benefit of large and growing agricultural and commercial interests involved in the raising and shipping of tropical products to neighboring countries.

Under the liberal administration of the new governor, Sir